REMARKS

Claims 20-22 and 24 are in the application. No claim is allowed.

Claims 20-24 are rejected under 35 USC 112, first par., as allegedly failing to comply with the written description requirement. Claim 20 has been amended to identify the flame front, rather than a flame front, to indicate that there is one flame front that moves through the bed of biomass. The multiple heaters of Antal are capable of forming four flame fronts, but each is at a different location in the bed. None of the flame fronts would be capable of moving from the distal end to the proximal end of the container since only one flame front can start at the distal end, and the others cannot do so. That flame front, if started, would be intercepted by flame fronts started at the locations of the other heaters, so it would not be the flame front that reaches the proximal end, if indeed it did reach there. Accordingly, the language distinguishes Antal. The language added to Claim 20 is clearly supported at page 6, lines 30-31:

> This flow of *gas from the proximal end to the distal end* of the reactor causes it to operate in a ***downdraft*** mode, i.e., as air flows down through the bed ***the flame front moves upward.*** [Italics added]

It is apparent and inherent in this description that if the air flows from the proximal end to the distal end, to operate in a downdraft, the flame front must move from the distal end to the proximal end. Accordingly, it is submitted that the claims comply with the 35 USC 112, first par. and withdrawal of the rejection is requested.

Claims 20-22 and 24 are rejected under 35 U.S.C. 103(a) as allegedly being unpatentable over Antal, Jr. et al. ("Antal"), reference H, in view of Bergman, reference N, and Tucker, Reference A (newly cited). This rejection is respectfully traversed. Reconsideration and withdrawal are respectfully requested in view of the following.

Claim 20 has now been amended to recite the features of Claim 23, now cancelled. To the extent that the claims now contain the features of Claim 23, the patentability of the claims with respect to those features are argued below in response to the second rejection.

Antal is deficient in several features, including the features of prior Claim 23. With the multiple heaters in Antal, one each located at the distal and proximal ends and two located between the ends, activation of the heaters would cause ignition at several locations within the biomass, forming several flame fronts. This would defeat the entire mode of operation of the present reactor,

which requires that the reactor be capable of igniting only a single flame front at the distal end, fed by air inflow at the proximal end. Moreover, there is no teaching in Antal to disable all but one of the heaters, and if so, which one should be used to ignite the biomass. Accordingly, the presently claimed reactor is structurally distinguished from that disclosed in Antal.

The examiner cites Bergman to show insulation on the canister, but Bergman does not remedy the above deficiencies of Antal. Bergman teaches the input of a compressed inert gas from the same end where the heating elements 13 are located. So even if air is used instead of inert gas, it is flowing from the same end as the flame, contrary to the mode of operation of the present invention. Accordingly, Bergman does not remedy the deficiencies discussed above in Antal.

The advantages of having a single flame front traveling in a directional draft mode with air intake from the opposite end is not afforded by the Antal reactor. The residence time in the presently claimed reactor is approximately 30 minutes, rather than the several hours (Antal, Table 1) for wet biomass. According to Table 1 in Antal, heating times less than an hour were only obtained when the biomass was predried (1.5% moisture content for Leucaena wood). According to the present invention the biomass need not be dried at all to use heating times of less than an hour.

The examiner further relies upon Tucker to show the use of downdraft gasifiers to produce intermediate equilibrium states giving better control over gas composition. From this, the examiner states it would be obvious to one of ordinary skill in the art at the time of the invention to eliminate all of the heating bands in Antal except the distal heating band to gain control taught by Tucker. Applicants respectfully disagree. Firstly, there are no heaters in either the gasification reactor 40 or the char reactor 10 disclosed in Tucker. The ignition in reactor 10 is accomplished by pumping hot gas in to the upper part of the reactor, but not into the solid fuel 16. Hence, in reactor 10 only two things can happen regarding the solid fuel 16. Either it is spontaneously and randomly ignited within the bed when the temperature is high enough, or even assuming ignition of a single flame front starts at the top of the solid bed (which Applicants do not concede), and additional oxygen is added at line 23, the oxygen is added at the same end. This is exactly the opposite of the present claims.

Turning to reactor 40 in Turner, the bed 43, if it is ignited at all, is ignited by the hot gases entering from reactor 10 through inlet 45. Additional hot gases can be added, if needed, from auxiliary heater 47. In any case, the ignition situation is exactly the same as in reactor 10. There is no heater in the solid fuel 43. Even if the fuel is not spontaneously and randomly ignited, if a single

flame front is formed it will start at the top of the bed and oxygen is added at the same end through line 50.

Accordingly, it is submitted that if Tucker adds anything at all, it is to teach one should heat the bed and introduce the air/oxygen at the same end of the bed. Tucker has nothing to do with how many heaters one should use surrounding the bed. As to the use of heaters surrounding the bed, Tucker's embodiments show none.

According to these different structural features of the presently claimed invention and the advantages obtained thereby, it is submitted that the present claims are unobvious over the combination of Antal, Bergman and Tucker. Withdrawal of the rejection is respectfully requested.

Claim 23, now cancelled, is rejected under 35 USC 103(a) as unpatentable over Antal in view of Bergman and Tucker, further in view of Koppelman. Since the features of Claim 23 are incorporated into Claims 20-22 and 24, this rejection will be addressed. Antal, Bergman and Tucker have been discussed above. The arguments above are applicable in response to the present rejection as well. As for the features incorporated from Claim 23, Applicants address Koppelman. In the Final Rejection the examiner clarifies her position by stating that Koppelman is relied upon to allegedly teach modification of Antal's device of inputting gas. The fact that the present claims call for inputting air, not inert gas, is not given patentable weight by the examiner. Applicants respectfully disagree with the examiner's application of Koppelman. The motivation for pre-heating the gases by Koppelman is (Col. 8, lines 52-60):

"To reduce the operating times under the embodiments disclosed in FIGS. 1-6, the inert gas which is passed through the system can be preheated to a temperature approaching the optimal operational temperatures of the heat exchanger medium. Desirable reductions in the overall operation time of the system have been obtained, for example, when the inert gas temperature has been preheated to approximately 50° F. below the temperature of the heated carbonaceous fuel."

The means used by Koppelman to attain this is apparently by externally preheating the inert gas at its source 34 (Fig.1), 234 (Fig. 2), 134 (Fig. 3). 338 (Fig. 4) or 447 (Figs. 5-6). Indeed, this is consistent with Koppelman's motivation to be able to control the temperature of the gas to an ideal temperature below the operating temperature of the reactor. But first it is pointed out that there are no heaters within Koppelman's reactors for igniting the solid fuel. The fuel is ignited by introducing sufficiently hot gases from an external source through line 46 (Fig. 1), 238 (Fig. 2), lines 144-147

(Fig. 3), 342a (Fig. 4) and 446 (Fig. 5-6). Then it is pointed out that in each of these cases, the inert gas is introduced directly into the reactor, without using the heat of the reactor to preheat the gas prior to contact with the reacting fuel. In no embodiment does Koppelman show that preheating of the inert gas should be done by using the heat of the reacting fuel in the reactor by running an elongated entry tube through the reacting fuel. It is submitted that to make such a modification would in fact teach away from Koppelman's motivation to be able to control the entering inert gas to an ideal temperature. The preheating temperature can be readily controlled to a desired temperature by heating the gas in an external source. However, within the reactor itself, the hypothetical extended tube and its contents would reach equilibrium with the internal temperature of the reactor. Once at equilibrium temperature, it would seem to be impossible to keep the preheat temperature to significantly less than the reactor temperature, as desired by Koppelman. Accordingly, when the motivation and the means discussed above in Koppelman are carefully examined, it is submitted that Koppelman teaches away from the modification of Antal suggested by the examiner. It is submitted that extension of Antal's gas inlet through the fuel bed would defeat the ability to preheat according to Koppelman.

Accordingly, it is respectfully submitted that Claims 20-22 and 24 are unobvious over the combination of Antal, Bergman, Tucker and Koppelman. Withdrawal of this rejection is requested.

It is submitted that upon entry of this amendment, this application is in condition for allowance.

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